Renewable and Sustainable Energy Reviews 14 (2010) 806–813

Contents lists available at ScienceDirect

Renewable and Sustainable Energy Reviews

journal homepage: www.elsevier.com/locate/rser

A review of Turkish natural gas distribution market

Erkan Erdogdu [a,b,1,*]

[a] *Energy Market Regulatory Authority, Ziyabey Cad. No: 19, 06520 Balgat/Ankara, Turkey*
[b] *University of Cambridge, Judge Business School, Trumpington Street, Cambridge CB2 1AG, UK*

ARTICLE INFO

Article history:
Received 4 September 2009
Accepted 20 October 2009

Keywords:
Natural gas distribution
Auction
Turkey

ABSTRACT

In Turkey, natural gas consumption started at 0.5 bcm (billion cubic meters) in 1987 and reached approximately 35 bcm in 2007. Turkish natural gas usage is projected to further increase remarkably in coming years. In 2001, a reform process was started to create and strengthen a competitive natural gas market. However, the reform has not worked out as expected so far. The present article discusses the application of auctions in Turkish natural gas distribution zones. After presenting a short summary of current literature, natural gas utilization and recent developments in Turkish natural gas market, we draw attention to our main focus, namely city natural gas tenders. Having described the tenders, we present problems associated with them. In the end, we touch upon some regulatory issues and provide some suggestions for improvement.

Contents

1. Introduction

Prevalence of market failures requires a significant element of regulation in natural gas networks. The main question for regulators is how to determine optimal prices and investment levels. Information is asymmetric between regulators and companies, and there are no obvious comparators. The regulatory task is therefore to break this information monopoly to determine the optimum. A novel and potentially rich source of such information is to use auctions, and it has become fashionable to extend auctions into networks.

The literature on Turkey's natural gas market in general and natural gas distribution tenders in particular is very limited, with the exception of some International Energy Agency (IEA) and Organization for Economic Cooperation and Development (OECD) studies. To the best of our knowledge, so far, there has been almost no study on either Turkish natural gas market or city natural gas distribution tenders in Turkey, which are usually discussed within the general context of energy markets. From a practical point of view, the lack of extensive discussions of the issue is one of the driving forces of this paper. In this context, one of our goals is to provide a general picture of the market reform and draw attention to inherent problems associated with tenders for Turkish natural gas distribution regions. Besides, from an academic perspective, this topic is also appealing because the method (or auction model) developed to determine the tariffs of natural gas distribution regions of Turkey is unique and never employed before anywhere

* Correspondence address: Energy Market Regulatory Authority, Ziyabey Cad. No: 19, 06520 Balgat/Ankara, Turkey. Tel.: +90 312 2872560.
E-mail address: erkan@erdogdu.net.
URL: http://erkan.erdogdu.net

[1] The author works as an Energy Expert at Energy Market Regulatory Authority of the Republic of Turkey. In October 2005, the author is awarded an "MSc with distinction" in "Energy Economics and Policy" by the Department of Economics, University of Surrey (UK). In October 2009, the author started his PhD studies at Judge Business School of Cambridge University (UK). The views, findings and conclusions expressed in this article are entirely those of the author and do not represent in any way the views of any institution he is affiliated with.

1364-0321/$ – see front matter © 2009 Elsevier Ltd. All rights reserved.
doi:10.1016/j.rser.2009.10.023

in the world. What is more is that the results of this specific model are also exceptional as in some regions firms accepted to set up all natural gas distribution infrastructure totally from their own sources and provide gas to consumers without any profit, challenging the very basic assumption of the science of economics, that is "*firms are profit seeking agents*". Since it is obvious that these tenders will have important implications for the future of the country, the present paper will be an important contribution not only to the existing literature but also to the energy policy formulation process in Turkey.

The paper begins with a presentation of recent natural gas market developments in Turkey (Section 2). To see what role auctions might play, a brief summary of economic fundamentals is provided (Section 3). A critical analysis of natural gas distribution tenders is also presented (Section 4). Following tentative guidelines for policy makers (Section 5), conclusions are drawn in the final part (Section 6).

2. Recent developments in Turkish natural gas market

In Turkey, natural gas began to be used for residential and commercial purposes in Ankara in 1988, and continued with Istanbul and Bursa in 1992, and then Eskisehir and Izmit in 1996. Turkey's natural gas consumption has increased rapidly for the last two decades. Economic growth and increasing use of natural gas in electricity, agriculture and households have kept demand soaring. Turkey's natural gas consumption has started with 0.5 bcm in 1987 and rapidly reached 35 bcm, by increasing about 67 times, in 2007 (Table 1). The average annual percentage increase in natural gas consumption is 14.93%. It is expected for this figure to reach 42 bcm in 2009, 45 bcm in 2010 and 67 bcm in 2020 (Table 2). In line with this trend, natural gas' share in total primary energy consumption increases as well. It was 5.4% in 1990, 9.4% in 1995 and 27.6% in 2005. It is predicted to become 25% in 2020 [1]. However, gas production and distribution could not keep up with the increasing demand. At present, Turkey's gas production covers only 2.85% of the consumption, because of very limited indigenous resources [2].

In Turkey, more than half of the gas is used for electricity generation and the share of electricity generation in gas consumption was 56% in 2007 (Table 1). In the same year, industry sector and households consumed equally the remaining part, about 22% each.

Table 1
Evolution of natural gas demand by sector (1987–2007) (million cubic meter).

Years	Electricity	Fertilizer	Households	Industry	Total
1987	522	–	–	–	522
1988	1,034	152	0	–	1,186
1989	2,759	382	7	5	3,153
1990	2,599	501	50	222	3,373
1991	2,908	485	190	547	4,132
1992	2,633	652	375	861	4,521
1993	2,595	797	549	1,011	4,952
1994	3,037	612	647	955	5,251
1995	3,857	732	1,014	1,190	6,793
1996	4,174	830	1,526	1,376	7,906
1997	5,019	761	2,041	1,899	9,721
1998	5,491	493	2,247	2,041	10,271
1999	7,950	144	2,429	1,858	12,382
2000	9,733	113	2,806	1,914	14,566
2001	10,994	121	2,849	2,063	16,027
2002	11,631	496	2,973	2,277	17,378
2003	13,513	469	3,944	3,012	20,938
2004	13,226	528	4,463	3,892	22,108
2005	15,435	594	5,843	4,993	26,865
2006	16,642	157	7,259	6,435	30,493
2007	19,658	–	7,836	7,569	35,064

Table 2
Natural gas demand and supply projections (1987–2020) (million standard cubic meter).

	2008	2009	2010	2015	2020
Total gas demand	38,025	41,640	44,543	56,920	66,604
Contracted gas supply	45,553	49,092	51,059	40,791	40,791
Supply surplus (+) or shortage (−)	+7,528	+7,452	+6,516	−16,129	−25,813

Public utilities were state enterprises in Turkey until 1990s. Fiscal crises, inadequate investment, poor quality of service, negative effects of rent seeking and external pressures provided an impetus for reform in the last decade. The same forces also played a crucial role in reforming the natural gas market.

The Turkish natural gas industry was state-owned and vertically integrated through the 1980s and the 1990s. As a part of energy market restructuring, the legal structure of the natural gas market was reformed in 2001 with a new law, namely Natural Gas Market Law (NGML, Law no: 4646[2]). The new law was a first step toward gradual liberalization and vertical separation in the market. The law aims to 'establish a legal framework for developing a fair, transparent and competitive natural gas market through unbundling market activities and eliminating the monopolistic structure in the market'. The new legal environment is projected to encourage privatization, establish a more competitive environment and prepare the ground for the integration to the EU natural gas market by harmonizing regulations. NGML designates Energy Market Regulatory Authority (EMRA) as the sole authority and describes the procedures for regulations in the market.

The state-owned company BOTAS is the only gas transmission company in Turkey. Its monopoly in natural gas imports, exports and wholesale trading was demolished with the enactment of the NGML and its current de facto dominating position in the import activities is subject to change in the course of the gas market reforms. The law requires BOTAS to transfer at least 10% of its total gas purchase quantity within the take-or-pay contracts every year to reach the 20% market share by 2009. Furthermore, the law also stipulates BOTAS to be legally unbundled after 2009 to form separate companies for transmission, storage, import and trade.

The law limits the amount an importer company can buy from abroad to 20% of the national consumption. Similarly, importers, wholesalers and distributors cannot have market shares more than 20% to ensure that competition will be institutionalized. Distribution companies cannot buy more than half of their gas from a single wholesaler or importer. The law gives discretion to EMRA to change these ratios.

In Turkey, distribution is carried out by local distribution companies. For the time being, the major distribution companies are EGO (renamed as BASKENTGAZ) in Ankara, IGDAS in Istanbul, IZGAZ in Izmit, AGDAS in Adapazari, BURSAGAZ in Bursa and ESGAZ in Eskisehir. IGDAS is owned by the municipality. AGDAS, BURSAGAZ, ESGAZ, IZGAZ and BASKENTGAS were privatized. Table 3 provides the list of distribution regions as of October 2008. The data in Table 3 are collected from [1,3] and various web sites of regional natural gas distribution companies in Turkey.

NGML requires companies to obtain licenses from EMRA for transmission, export, import, wholesale, distribution and storage activities. Licenses are granted for a minimum of 10 and maximum of 30 years. As of October 2008, EMRA issued a total of 168 licenses, of which 11 is for import, 1 is for export, 28 is for wholesale, 4 is for storage, 1 is for transmission, 15 is for LNG transmission, 48 is for CNG and 60 is for distribution [3].

[2] The law meets with the requirements of the 2003 EU Gas Directive.

Table 3
Natural gas prices in distribution regions of Turkey (October 2008).

No	Distribution region—company	Tender date	First gas supply date	Cost of gas purchase from BOTAS (YTL/m^3)	As % of total price	Special consumption tax (YTL/m^3)	As % of total price	USDC (¢/kwh)	USDC (¢/m^3)	USDC (YTL/m^3)	As % of total price	Value added tax (18%)	As % of total price	Gas price for households (YTL/m^3)	Connec.fee ($)
1)	Kayseri—KAYSERIGAZ	19.06.2003	01.10.2004	0.651867	80.7	0.023	2.8	0.076	0.809	0.009791	1.2	0.123238	15.3	0.807896	180
2)	Konya—GAZNET	31.07.2003	21.10.2004	0.651867	80.9	0.023	2.9	0.064	0.681	0.008245	1.0	0.122960	15.3	0.806072	180
3)	Erzurum—PALEN	13.08.2003	08.11.2004	0.651867	81.1	0.023	2.9	0.046	0.489	0.005926	0.7	0.122543	15.3	0.803336	180
4)	Corlu—CORDAS	28.08.2003	25.06.2005	0.651867	81.3	0.023	2.9	0.036	0.383	0.004638	0.6	0.122311	15.3	0.801816	180
5)	Gebze—PALGAZ	11.09.2003	01.12.2004	0.651867	81.1	0.023	2.9	0.052	0.553	0.006699	0.8	0.122682	15.3	0.804248	180
6)	Inegol—INGAZ	18.09.2003	24.10.2004	0.651867	80.9	0.023	2.9	0.061	0.649	0.007859	1.0	0.122891	15.3	0.805616	180
7)	Catalca—TRAKYADAS	25.09.2003	25.10.2005	0.651867	81.2	0.023	2.9	0.044	0.468	0.005668	0.7	0.122496	15.3	0.803032	180
8)	Bandirma—BADAS	09.10.2003	27.01.2005	0.651867	79.2	0.023	2.8	0.174	1.851	0.022416	2.7	0.125511	15.3	0.822794	180
9)	Balikesir—BALGAZ	16.10.2003	05.01.2005	0.651867	80.1	0.023	2.8	0.112	1.192	0.014429	1.8	0.124073	15.3	0.813369	180
10)	Sivas—SIDAS	30.10.2003	21.10.2005	0.651867	79.4	0.023	2.8	0.164	1.745	0.021128	2.6	0.125279	15.3	0.821274	180
11)	Kutahya—CINIGAZ	06.11.2003	04.01.2005	0.651867	80.0	0.023	2.8	0.124	1.319	0.015975	2.0	0.124352	15.3	0.815193	180
12)	Eregli (Konya)—NETGAZ	04.12.2003	16.10.2005	0.651867	79.3	0.023	2.8	0.172	1.830	0.022159	2.7	0.125465	15.3	0.822490	180
13)	Corum—CORUMGAZ	18.12.2003	15.10.2004	0.651867	80.6	0.023	2.8	0.079	0.841	0.010178	1.3	0.123308	15.3	0.808353	180
14)	Kirikkale Kirsehir—KIRGAZ	08.01.2004	29.09.2005	0.651867	79.5	0.023	2.8	0.158	1.681	0.020355	2.5	0.125140	15.3	0.820362	180
15)	Samsun—SAMGAZ	22.01.2004	29.10.2005	0.651867	81.0	0.023	2.9	0.055	0.585	0.007086	0.9	0.122751	15.3	0.804704	180
16)	Aksaray—AKSARAYGAZ	12.02.2004	22.11.2005	0.651867	78.3	0.023	2.8	0.236	2.511	0.030404	3.7	0.126949	15.3	0.832219	180
17)	Duzce Karadeniz Eregli—DERGAZ	08.04.2004	30.11.2005	0.651867	81.3	0.023	2.9	0.034	0.362	0.004380	0.5	0.122264	15.3	0.801512	180
18)	Gemlik—GEMDAS	22.04.2004	08.12.2005	0.651867	78.3	0.023	2.8	0.239	2.543	0.030790	3.7	0.127018	15.3	0.832675	180
19)	Yalova—ARMAGAZ	01.07.2004	19.11.2005	0.651867	81.4	0.023	2.9	0.031	0.330	0.003994	0.5	0.122195	15.3	0.801056	180
20)	Usak—UDAS	02.12.2004	26.10.2005	0.651867	81.0	0.023	2.9	0.055	0.585	0.007086	0.9	0.122751	15.3	0.804704	180
21)	Polatli—POLGAZ	13.01.2005	09.02.2006	0.651867	78.4	0.023	2.8	0.230	2.447	0.029631	3.6	0.126810	15.3	0.831307	180
22)	Izmir—IZMIRGAZ	27.01.2005	01.06.2006	0.651867	81.7	0.023	2.9	0.012	0.128	0.001546	0.2	0.121754	15.3	0.798167	180
23)	Manisa—MANISAGAZ	24.02.2005	13.10.2006	0.651867	81.6	0.023	2.9	0.016	0.170	0.002061	0.3	0.121847	15.3	0.798775	180
24)	Nigde Nevsehir—KAPADOKYAGAZ	17.03.2005	23.09.2006	0.651867	80.4	0.023	2.8	0.098	1.043	0.012625	1.6	0.123749	15.3	0.811241	180
25)	Bilecik Bolu—BEYGAZ	09.06.2005	01.03.2006	0.651867	81.6	0.023	2.9	0.016	0.170	0.002061	0.3	0.121847	15.3	0.798775	180
26)	Karabuk Kastamonu Cankiri—KARGAZ	16.06.2005	Supplied	0.651867	80.8	0.023	2.9	0.069	0.734	0.008889	1.1	0.123076	15.3	0.806832	180
27)	**Edirne Kirklareli Tekirdag—TRAKYAGAZ**	**23.06.2005**	**01.04.2006**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**0**
28)	Yozgat—SURMELIGAZ	30.06.2005	17.11.2006	0.651867	79.2	0.023	2.8	0.176	1.873	0.022674	2.8	0.125557	15.3	0.823098	180
29)	Malatya—PEGAZ	07.07.2005	22.08.2006	0.651867	81.3	0.023	2.9	0.037	0.394	0.004767	0.6	0.122334	15.3	0.801968	180
30)	Kahramanmaras—ARMADAS	14.07.2005	22.12.2006	0.651867	81.7	0.023	2.9	0.009	0.096	0.001159	0.1	0.121685	15.3	0.797711	180
31)	**Denizli—KENTGAZ**	**21.07.2005**	**26.10.2006**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**149**
32)	**Gaziantep Kilis—GAZDAS**	**28.07.2005**	**10.10.2007**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**30**
33)	Sanli Urfa—GURGAZ	09.11.2005	17.12.2007	0.651867	80.4	0.023	2.8	0.095	1.011	0.012239	1.5	0.123679	15.3	0.810785	180
34)	Canakkale—CANAKKALEGAZ	16.12.2005	22.12.2006	0.651867	81.8	0.023	2.9	0.001	0.011	0.000129	0.0	0.121499	15.3	0.796495	180
35)	Isparta Burdur—TOROSGAZ	23.12.2005	01.09.2008	0.651867	81.6	0.023	2.9	0.015	0.160	0.001932	0.2	0.121824	15.3	0.798623	180
36)	**Afyonkarahisar—AFYONGAZ**	**06.01.2006**	**09.11.2007**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**174**
37)	Kars Ardahan—KARGAZ Kars Ardahan	20.01.2006	18.06.2008	0.651867	77.7	0.023	2.7	0.279	2.969	0.035943	4.3	0.127946	15.3	0.838756	180
38)	Erzincan—ERZINGAZ	27.01.2006	20.11.2007	0.651867	80.5	0.023	2.8	0.089	0.947	0.011466	1.4	0.123540	15.3	0.809873	180
39)	Karaman—DOGANGAZ	03.02.2006	08.09.2007	0.651867	79.7	0.023	2.8	0.144	1.532	0.018551	2.3	0.124815	15.3	0.818234	180
40)	**Amasya Tokat Turhal—TAMDAS**	**10.02.2006**	**02.01.2008**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**163**
41)	**Antalya—OLIMPOSGAZ**	**17.02.2006**	**Not specified yet**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**5**
42)	K.bey M.Kemalpasa Susurluk—OVAGAZ	24.02.2006	17.11.2007	0.651867	80.6	0.023	2.8	0.081	0.862	0.010435	1.3	0.123354	15.3	0.808657	180
43)	**Elazig—ELAZIGGAZ**	**21.07.2006**	**27.03.2008**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**5**
44)	Trabzon Rize—KARADENIZGAZ	15.09.2006	01.09.2008	0.651867	81.7	0.023	2.9	0.008	0.085	0.001031	0.1	0.121662	15.3	0.797559	180
45)	Gumushane Bayburt	22.09.2006	Not specified yet	0.651867	78.1	0.023	2.8	0.250	2.660	0.032207	3.9	0.127273	15.3	0.834348	180
46)	Diyarbakir—DIYARGAZ	03.11.2006	Not specified yet	0.651867	77.6	0.023	2.7	0.290	3.086	0.037360	4.4	0.128201	15.3	0.840428	180
47)	Adiyaman—AKMERCANGAZ	01.12.2006	Not specified yet	0.651867	81.7	0.023	2.9	0.010	0.106	0.001288	0.2	0.121708	15.3	0.797863	180
48)	**Ordu Giresun—FINDIKGAZ**	**08.12.2006**	**Not specified yet**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**169**
49)	Van	16.03.2007	12.03.2008	0.651867	77.5	0.023	2.7	0.297	3.160	0.038262	4.5	0.128363	15.3	0.841493	180
50)	Seydisehir Cumra	23.03.2007	Not specified yet	0.651867	80.9	0.023	2.9	0.063	0.670	0.008116	1.0	0.122937	15.3	0.805920	180
51)	Agri	30.03.2007	Not specified yet	–	–	–	–	No bid	–	–	–	–	–	–	–
52)	**Cukurova—AKSAGAZ**	**20.07.2007**	**Not specified yet**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**167**
53)	Siirt Batman	28.12.2007	Not specified yet	0.651867	78.3	0.023	2.8	0.235	2.500	0.030275	3.6	0.126926	15.3	0.832067	180

54)	**Aydin**	**08.02.2008**	**Not specified yet**	**0.651867**	**81.9**	**0.023**	**2.9**	**0.000**	**0.000**	**0.000000**	**0.0**	**0.121476**	**15.3**	**0.796343**	**165**
55)	Gevye Ali Fuat Pasa Pamukova	06.06.2008	Not specified yet	–	–	–	–	Cancelled	–	–	–	–	–	–	–
56)	**Istanbul–IGDAS**	**Public**	**Supplied**	**0.651867**	**73.0**	**0.023**	**2.6**	**0.635**	**6.755**	**0.081784**	**9.2**	**0.136197**	**15.3**	**0.892848**	**190**
57)	Ankara–BASKENTGAZ	Privatized	Supplied	0.651867	74.4	0.023	2.6	0.522	5.555	0.067260	7.7	0.133583	15.3	0.875710	190
58)	**Adapazari–AGDAS**	**Privatized**	**Supplied**	**0.651867**	**72.5**	**0.023**	**2.6**	**0.673**	**7.165**	**0.086759**	**9.7**	**0.137093**	**15.3**	**0.898719**	**290**
59)	Izmit–IZGAZ	Privatized	Supplied	0.651867	73.4	0.023	2.6	0.602	6.403	0.077526	8.7	0.135431	15.3	0.887824	190
60)	Eskisehir–ESGAZ	Privatized	Supplied	0.651867	78.3	0.023	2.8	0.235	2.500	0.030270	3.6	0.126925	15.3	0.832062	190
61)	Bursa–BURSAGAZ	Privatized	Supplied	0.651867	78.3	0.023	2.8	0.235	2.500	0.030270	3.6	0.126925	15.3	0.832062	190
62)	Bahcesehir–BAHCESEHIR	Privatized	Supplied	0.651867	73.3	0.023	2.6	0.611	6.498	0.078680	8.8	0.135638	15.3	0.889185	190

$/YTL parity in October 2008: 1.2108; m³/kwh: 10.64; unit service and depreciation charge: USDC. The bold values emphasize the distribution regions where connection fee is NOT $180.

As the gas infrastructure is being expanded, new consumers are joining the networks. Tender procedures for distribution and customer connection lines in 53 new regions have been completed. At present about 50 (out of 81) cities are supplied with natural gas. All cities are expected to have access to gas after the completion of the south pipeline stretching from Konya to Izmir and the north-east pipeline stretching from Gumushane to Trabzon and from Bayburt to Rize.

It is the task of EMRA to determine the principles and procedures for setting the regulated prices and tariffs. At present, EMRA applies the price ceiling to storage, wholesale and transmission tariffs. As for distribution in existing (public and privatized) distribution zones, EMRA determines unit service and depreciation charges for the supply of natural gas. EMRA is responsible for organizing tenders for new natural gas distribution licenses in the cities. Prequalification for tendering is based on the financial strength and experience of the potential licensees. Evaluation of the tenders is based on the *unit service and depreciation charge* (USDC) for supplying one kWh of natural gas to consumers (¢/kwh). So, for distribution zones tendered by EMRA, USDCs are determined as a result of tenders. Licenses are granted for 30 years. So far (as of October 2008), the tender processes have been carried out in 55 cities.

Consumers whose annual consumption is above the threshold set by EMRA have the right to choose their own gas suppliers. At present, the gas market opening rate is 80%. Although eligible consumers have the right to choose their suppliers, this right cannot currently be exercised because of the *de facto* monopolistic position of BOTAS in import and trade.

The main objective of Turkish energy policy is to respond the ever increasing energy demand in a reliable, sufficient, prompt, economic and environmentally sound manner so as to attain economic and social development targets. In this context, the objectives of the Turkish government in the domestic natural gas market are as follows:

- Spreading the use of natural gas.
- Expansion of gas transmission networks.
- Construction of gas distribution networks in the cities.
- Establishment of a liberal and competitive natural gas market.

3. A brief summary of economic fundamentals

Having provided a general picture of Turkey and her natural gas market, let us turn to our main subject, namely, the application of auctions in the Turkish natural gas distribution zones. Before presenting our critical analysis, we want to pay some attention to the literature that justifies the application of auctions in energy networks.

An industry is a natural monopoly if a single firm can produce more efficiently than two or more firms. Gas distribution networks are regarded to be natural monopolies. Left to the market, they will be undersupplied at prices which exceed marginal costs. The regulatory approach to the natural monopoly problem is based upon the establishment of agencies endowed with powers to control prices, entry, conditions of service and so on in a particular industry or group of industries. In principle, regulatory agencies could be set up to monitor the behavior of public corporations, but we will focus here upon their use in market environments characterized by private ownership.

All regulators are naturally skeptical of a utility's initial bid to invest and operate an energy network (or any network), given the incentives of the firms to 'game' the periodic reviews. That is, one of the fundamental regulatory questions has been how to enjoy the cost benefits of single-firm production without suffering from monopolistic behaviour. Franchising provides an answer to that

question in the form of a competition for the market, where several firms competing to be one that actually operates in the market. That is to say, it provides a mechanism for regulators that enables them not to try to adjudicate on the 'right' answer, but rather leave it to the market mechanisms.

Franchising involves conferring rights in the supply of a good or service to a sole producer for a specified period of time. It is regarded as an essential mechanism for introducing competition *for* the market where competition *within* the market is not feasible or desirable. Natural monopolies are, therefore, obvious candidates for franchising.

The concept of "franchising" was first pronounced by Chadwick [4] and popularized by Demsetz [5]. In a so-called "Chadwick–Demsetz" auction, competition takes place through bidding for the franchise contract, and the winner is the one who bids the lowest price to supply the good or service, or more generally, who offers the best price-quality package.

At first sight, franchising appears to provide a very attractive way of combining competition and efficiency without any heavy burden for regulators. The competition for market appears to destroy the undesirable monopoly of information that hinders conventional regulation, and price is set by competition, not by bureaucrats. Provided bidding is competitive, a Chadwick–Demsetz auction will reduce the profits to the normal competitive level by inducing bid prices equal to unit costs of production.

Nevertheless, franchising is not without some difficulties. First of all, as mentioned above, bidding must be competitive and cases of collusive bidding need to be prevented. There exist mainly two reasons why bidding for the franchise might fail to be competitive. First of all, there is a danger of collusion between bidders, especially if they are few in number, or if the firms are effectively in a repeated interaction (or, "game") with one another via frequent contracts. The second reason is that one firm might enjoy such strategic advantages in the competition for the franchise that other firms would be unwilling to compete with it. For instance, suppose that an incumbent firm is the holder of a franchise that is now up for renewal. Since, thanks to its past operation of the franchise, the incumbent has already reduced its costs; other firms will be unwilling to compete with the incumbent as they know that they are unlikely to win the competition. Also, another source of incumbent advantage may originate from asymmetries of information. The incumbent's knowledge of cost and demand conditions is likely superior to that of any other firm, which tends to deter others from competing with it for the future franchise.

The merits of franchising are further reduced by the issues related with asset handover. Unless sunk costs are zero (an extremely unlikely event), efficiency requires that the new operator of the franchise takes over the assets from the incumbent. Therefore, one needs to decide how the assets to be valued for this purpose. In such a case, there is a problem of bilateral monopoly. If incumbent has no alternative, it has to accept as little as the scrap value of the assets. If the new operator has no alternative, it has to pay as much as their replacement value. The gap between replacement value and scrap value is likely to be large if the assets involve sunk costs.

The last difficulty with franchising is the question of specification, administration and monitoring of franchise contract. The duration of franchise contract must also be considered. The difficulties of contract specification and administration perhaps suggest that short-term contracts have advantages, because fewer future unforeseeable events then need to be considered. Nevertheless, the organization of frequent contests for the franchise also involves major costs: all the problems of asset valuation and handover occur more often, and the industry would frequently be in a state of turmoil.

Actually, the Chadwick–Demsetz proposal is an ingenious scheme if the contract in question is simple (such as auctions for taxi license plates). There are no doubt some economic activities where franchising would be an attractive scheme. But we are concerned with industries (such as natural gas distribution) in which the difficulties of contract specification and administration would be immense. Therefore, regulation is an essential part of franchising. Far from being an alternative to regulation, franchising requires it.

In short, auctions are methods of revealing information in the context of the network operators' near-monopoly of information. They give some indications of firms' willingness to reduce their profit so as to invest in the specific industry in question. Clever auction design filters out some imperfections associated with auctions, and therefore the detail is extremely important.

But what is the focus of auctions? One clear role is to allocate network operation in predefined areas. In principle, auctions should be good at this. The property right is typically well defined—the bidders know what they are buying [6]. As long as auctions are confined in this way, there should be little controversy. Their use depends on the costs of design and implementation and the benefits of the information revealed, compared with other methods.

If regulators seriously want also to rely on auctions for investment determination, there is a great deal to do to create some of the necessary conditions. Competition in the auctions is required, and a series of structural measures would probably be necessary. In such a context, auctions require the support of a planning approach. They cannot be relied upon to determine investment in their pure form. It does not, however, follow that auctions are therefore irrelevant. The information they create is not valueless. On the contrary, auctions provide a method to discover whether there are firms willing and able to invest in networks with as least profits as possible. That is, designing an auction provides a plan. The actual auction process tests the plan. However – and this is a crucial 'however' – the determination of the investment level should rest with the regulator not the auction. The notion of auctions as part of the planning process also raises the issue of the degree of regulation that auctions might require. Not only do investors in natural monopolies depend upon regulatory protection to finance their functions, but auctions also require regulators to determine the property rights and prevent the abuse of market power. Auctions are, therefore, likely to require intensive regulation, as well as being placed within the planning context. Whether these costs are worth the expected benefits is an empirical question.

4. A critical analysis of natural gas distribution tenders

Given the current natural gas market developments in Turkey and related literature, let us concentrate and analyze natural gas distribution tenders in Turkey and their current and expected effects on consumers. For the sake of simplicity and due to limited nature of the paper, we will regard only households as consumers, ignoring industry and electricity generation sectors.

As discussed before, in Turkey, EMRA is responsible for organizing tenders for natural gas distribution licenses in cities. So far, 55 tender processes were carried out. The main characteristics of these tenders may be summarized as follows:

- Distribution licenses are granted through a tender process for 30 years.
- Prequalification to participate in the tenders is based on financial strength and experience of the company.
- Evaluation is based on the "unit service and depreciation charge" (expressed as an US cent) (USDC) for supplying one KWh of natural gas to consumers for the first 8 years.

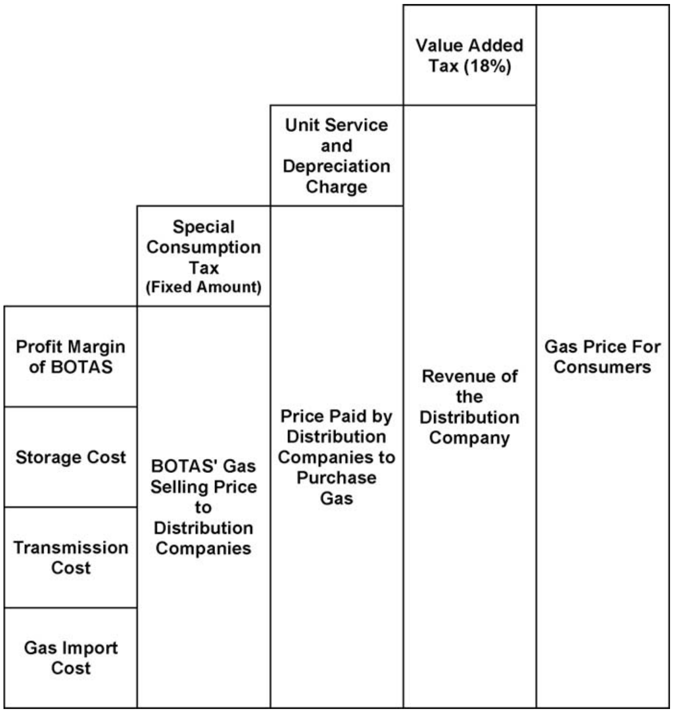


Fig. 1. Components of natural gas price for households.

- The firm with lowest USDC bid wins the tender and is qualified to set up all natural gas distribution infrastructure and supply gas to all consumers in its predefined region.
- The distribution companies may charge consumers a one-time "connection fee" when they are connected to network for the first time. The upper limit of this charge is determined by EMRA. Apart from this, USDC is the sole source of winning firm for both profit and income to recover its investments for the first 8 years.
- After the first 8 years, the firm will submit a tariff proposal to EMRA and new tariff will be determined by EMRA.
- The firm is required to start investment within 6 months.
- It is also required to start providing gas to consumers within 18 months and cover all consumers in 5 years.

BOTAS' existing monopoly in the gas market does not allow distribution companies to purchase gas from competitive producers, wholesalers or importers, even though they have *de jure* right to do so according to NGML. So, in practice, all distribution companies purchase gas from BOTAS. The main components of natural gas prices for households are presented in Fig. 1.

When we evaluate Fig. 1 and Table 3, we may easily see that USDC is the only source of the distribution company for both recovering its investments and making a profit. Since they are commercially sensitive and not open to public, Table 3 does not show the components of BOTAS' gas selling price to distribution companies. If we analyze Table 3 in more detail, following striking points can be highlighted:

- The only price component that changes from one region to another is USDC, all other components are the same in all distribution regions.
- The share of USDC in total price fluctuates between 0% and 9.7%, meaning that in some regions (those where USDC is 0%) consumers pay about 10% less for natural gas than others living in other regions (those where USDC is 9.7%).
- Since USDC means investment recovery and profit for the distribution company, it is extremely striking to see that as a result of tenders in 10 regions (highlighted in Table 3), the bid of the winning firm for USDC was "0", meaning that in the first 8 years these firms agree that they will not recover their investment and will not make any profit!
- Even more striking example is the tender for Edirne–Kirklareli–Tekirdag distribution region. In this tender, after participating firms bid "0" for USDC, the tender continued on connection fee and it is announced that the firm with lowest connection fee proposal wins the tender. However, firms again reduced their bids up to "0". Then, the tender continued based on how much to pay extra money to operate in the region! At the end, the firm that accepted to pay 2,500,000 YTL (about $2 million) won the tender. So, in this region, the winning firm accepted that for the first 8 years it will invest into infrastructure and connect consumers without any cost recovery, will not make any profit and, most remarkably, will pay even extra money to operate!
- The share of USDC in total price in tendered regions differs from that in privatized and publicly owned regions. The share of USDC is between 9.7% and 3.6% in privatized and public-owned regions while it is just between 4.5% and 0% in tendered regions. So, it may easily be concluded that consumers in tendered regions pay about 5% less than those living in other areas.
- A closer look to gas prices reveals that the main gas price components are the cost of gas purchase from BOTAS (72.5–81.9%) and taxes (17.8–18.1%). So any effective means to reduce gas prices should include a reduction in one of these, especially in gas purchase costs.

This unique tender process based upon USDC seems at first sight a clear success as it limits the profits of distribution companies and even in some cases reduces them to zero! However, a deeper analysis may reveal that it is actually not the case. Do we really expect firms to invest and operate without any cost recovery and profit? Are they charity organizations? Of course, answer is straightforward: "No!" So, why do they bid "0"? Actually, there are four explanations to this extraordinary situation. First of all, it is argued that although firms may incur a loss during the first 8 years, they expect a tariff from EMRA that allows them to recover their losses and have a huge profit in the second tariff period after the first 8 years. According to this explanation, in spite of some losses in the first 8 years, firms still bid "0" just to keep this region in their hands as they expect enormous returns in the following period. Second explanation relates the connection fees. Supporters of this argument point out that since almost all consumers will be connected for the first time in these regions, the total income from connection fees is enough to cover all investment cost and provide a reasonable return during the first 8 years. Advocates of the third explanation state that large gas consumers in some regions come together and bid "0" not to pay for USDC to any alternative distribution company. This explanation assumes that the gain from not paying USDC is more than the cost of setting up all natural gas distribution infrastructure and supplying gas to consumers without any profit. Final answer to the question focuses on the future market policies of the firms. It states that firms bid "0" as they regard these distribution areas just as "markets" for the gas they are to import from other countries. The adherents of this view are in the opinion that when BOTAS' *de facto* monopoly on import is abolished in practice, current distribution firms will set up some sister companies, get import licenses from EMRA, import gas from other countries and sell it in their distribution zones with huge profits. This view assumes that firms do not expect any profit from their distribution activities, but they expect enormous gains from their future import businesses as there exists no limit in Turkey on how much profit an importer can make as long as distribution company proves that it purchases gas from the most "economical" source.

The economic literature on auctions presumes tenders on a regular basis. However, Turkish version differs from the mainstream literature in that only one tender is projected for each distribution region in Turkey. The tariff setting process for the period after the first 8 years is not clear. After the first 8 years, there may be a tariff structure based on a rate-of-return-regulation (RoRR) or price cap (RPI-X) or there may be another tender-based system. In short, in Turkey, there is what we call a "*problem of regulatory inconsistency*", meaning that while licenses are granted for 30 years, the tenders determine USDCs just for 8 years. A logical solution to this problem may be the following strategy. Before 8 year period expires, EMRA receives proposals for second-term USDCs from distribution companies and approves them if they are below the current USDC levels. If proposals are above the previous levels, EMRA must organize new tenders for the distribution zones. EMRA should not approve any USDC proposal above current levels as such a policy may result in excessive profits. Because of information asymmetries, like any other regulatory authority, EMRA could not determine optimum level of USDC levels and it may also be a target for 'regulatory capture' if it tries to do so. Besides, if EMRA employs such a strategy, the first answer to the question "why do firms bid '0' in tenders?" mentioned above may be falsified. As for second question, it is not likely as it is very questionable whether or not the total revenue from connection fees is able to cover all investment and operation costs. In particular, this argument is totally displaced by the tender for Edirne–Kirklareli–Tekirdag distribution region in which even connection fees turned out to be "0". Third explanation is also not plausible as it is again very questionable whether or not gains from not paying USDC is more than the cost of setting up all natural gas distribution infrastructure and supplying gas to consumers without any profit. Among four explanations, the final one is the one that sounds most convincing. However, there is nothing wrong with such a situation. If a distribution company sets up an importing company, imports gas via it, purchases gas from its importing company by proving that it is the most 'economical' source, and then distributes gas without any profits and finally makes profits from its importing business; let it do so.

5. Guidelines for policy makers

Having discussed and analyzed Turkish natural gas distribution market let me provide some policy guidelines for those involved in policy making process in Turkey. First of all, EMRA should solve what we call "the problem of regulatory inconsistency" by announcing that if the tariff proposals for second-term USDC levels exceed the current levels new tenders for these regions will be arranged. What is more, a consistency between license and tender periods should be established. That is, if USDC levels are determined in a tender for 8 years, then licenses should be issued for the same period of time. Therefore, distribution licenses should be granted for 8 years. It will be a vital mistake for EMRA to try to determine second-term USDC levels by itself as EMRA is very unlikely to be able to set optimum levels due to information asymmetries and in such a situation it will prone to 'regulatory capture'.

Second policy suggestion relates to the principle of 'transparency'. EMRA should not only clarify the tariff determination process for the second tariff period and announce it but also investigate any issue that violates this principle. For the time being, it is surprising to see that there is no report or any kind of document that is published by EMRA to investigate why firms bid '0' in tenders. EMRA should examine such kind of unexpected behaviour of market actors and publish the findings regularly to provide transparency in market mechanism. However, it should not follow that EMRA should take action against those firms bidding '0' in tenders. Unless these bids damage functioning of the market, there is no need for action on the part of EMRA.

Investment is the focus of the third policy proposal. The literature on auctions and experience so far show that tenders do not guarantee optimal investment levels. Even, firms are encouraged to reduce the level of investment as any reduction in investment means profit for them. To illustrate our point, let us consider Turkish case. Assuming that USDC is determined as 10 units in a tender and the winning firm allocates 6 units for recovering its investments and 4 units as the return for its services, the firm is motivated to reduce its investments as if it does so, say, only 3 units will be sufficient to recover its investments and the remaining 3 units will be the pure profit. To prevent such an outcome, the determination and supervision of investments should be separated from service charges and tenders should be conducted just to determine "unit service charge" (USC) while investment related issues are regulated by the market regulator, namely EMRA.

Despite the fact that so far no problem has been observed in terms of competitiveness of the tenders, EMRA should guarantee that its auctions are competitive and there is no collusive bidding. Also, EMRA should project and develop solutions to potential problems related with asset handover if the distribution company in a region is required to be replaced as a result of a tender.

Final two policy remarks are about general energy policy of Turkey. First of all, it is easily seen in Table 3 that about 80% of the gas price for households comes from the cost of gas purchase from BOTAS. So, any effective policy to reduce gas prices should target this item. Unless distribution companies are allowed in practice to purchase gas from importers and wholesale companies other than BOTAS, it is almost impossible to have effective price reductions. Besides, BOTAS' current *de facto* monopoly power not only delays competitive trading in the market but also weakens the connection between diversity of supply and competitive structure in the market. The existence of a monopoly in the middle of the market process may also be seen as the reluctance on the part of government to delegate some of its power to market participants. BOTAS' transfer of some of its contracts to private parties is a good sign. However, it is politically motivated and there is no assurance that BOTAS will not change course on legal or political grounds. The delay on import contracts is a good indicator of this slippery ground.

The final policy advice questions the very logic of Turkish natural gas policy. In Turkey, only 3% of gas consumed is produced domestically, the remaining 97% is imported. Then, more than half of this gas (56%) is used to produce electricity, and the remaining is consumed by households and industry almost equally. Even if we accept that the encouragement of the expansion of the gas distribution networks to cities is an acceptable policy for the environmental benefits, there is no logical justification for the usage of an imported source in electricity production and industry at such a gigantic scale. Turkey should take every necessary step to reduce natural gas consumption in electricity generation and industry. If done so, the share of imported natural gas in primary energy sources may be reduced from current level of about 27% up to 6% [7].

6. Conclusion

Regulated private ownership in fact does not provide completely satisfactory solution to the natural monopoly problem. In natural gas distribution industries, however, it is superior to the other possibilities. Competition without regulation is unlikely to

be sufficiently effective and franchising without regulation is inappropriate to complex circumstances.

In this paper, we have tried to offer a glimpse of the application of auctions to energy networks and used Turkey as a case study. We touched upon Turkish natural gas distribution industry and surrounding issues in Turkish natural gas market. We see that so far the legal reform and the regulatory agency have not been able to establish a market structure that reinforces and promotes a 'liberal' market.

We may conclude that BOTAS' ongoing monopoly in the natural gas market – such as its share in imports, long-term purchase contracts and possession of transmission grids – not only increases the costs of transition to a competitive regulatory setting but also prevents price reductions in gas prices. So, it is completely necessary to reduce BOTAS' dominant role in the market in order to successfully institutionalize competition and reduce prices to *just and reasonable* levels.

In sum, the efforts to reform natural gas industry remain sluggish in Turkey. The opportunities to build a competitive market still exist, although institutional costs are increasing.

Acknowledgements

I would like to thank Energy Expert Mehmet ERTURK for his very helpful comments. His constructive remarks are gratefully acknowledged. The errors are mine.

References

[1] BOTAS (Petroleum Pipeline Corporation). BOTAS web site; 2008, Accessed from http://www.botas.gov.tr on 12.11.2008 at 13:20.
[2] IEA (International Energy Agency). Natural gas information: 2008 edition. Paris, France: IEA; 2008.
[3] EMRA (Energy Market Regulatory Authority). EMRA web site; 2008, Accessed from http://www.epdk.org.tr on 12.11.2008 at 11:22.
[4] Chadwick E. Results of different principles of legislation and administration in Europe; of competition for the field, as compared with competition within the field, of service. Journal of the Statistical Society of London 1859;22(3): 381–420.
[5] Demsetz H. Why regulate utilities? Journal of Law and Economics 1968;11(1): 55–65.
[6] Helm D. Auctions and energy networks. Utilities Policy 2003;11:21–5.
[7] IEA (International Energy Agency). Energy balances of OECD countries 2005–2006: 2008 edition. Paris, France: IEA; 2008.